CLAIMS:

What is claimed is:

1. A method for enhancing dynamic range of data read from an imaging sensor, said imaging sensor comprising N linear pixel arrays, each of the N linear arrays having M charge coupled pixels, each pixel charge coupled, and further being coupled to one of N registers, the method comprising:

integrating charge in at least some pixels of the N linear pixel arrays;

combining charge from a first region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the first region along each of the N linear pixel arrays to each of the N registers, said first region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the N registers along a linear path;

representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals;

combining charge from a second region of the N linear pixel arrays in the N registers by shifting charge from said at least one pixel line of the second region along each of the N linear pixel arrays to each of the N registers, said second region having at least one pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the N registers along a linear path; and

representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals.

2. The method for increasing dynamic range recited in claim 1 above further comprises:

presenting said portion of N first region data signals; and

presenting said portion of N second region data signals.

3. The method for increasing dynamic range recited in claim 2 above, wherein said first portion comprises N first region data signals and said second portion comprises N second region data signals.

4. The method for increasing dynamic range recited in claim 1 above further comprises:

defining the first region of the N linear pixel arrays of the imaging sensor by designating at least one pixel line as belonging to the first region of the N linear pixel arrays.

5. The method for increasing dynamic range recited in claim 4 above, wherein defining the first region of the N linear pixel arrays of the imaging sensor by designating at least one pixel line as belonging to the first region of the N linear pixel arrays further comprises:

assessing a level of improvement in dynamic range in at least one signal taken from the portion of N first region data signals, and the portion of N second region data signals; and

determining an amount of pixel lines belonging to the first region of the N linear pixel arrays for improving the dynamic range in the at least one signal, wherein said amount of pixel lines relates to the level of improvement in dynamic range.

6. The method for increasing dynamic range recited in claim 4 above, wherein defining the first region of the N linear pixel arrays of the imaging sensor by designating at least one pixel line as belonging to the first region of the N linear pixel arrays further comprises:

setting at least one target signal level;

selecting at least one signal from one of the portion of N first region data signals and the portion of N second region data signals;

comparing the selected at least one signal to the at least one target signal level; and

adjusting an amount of pixel lines belonging to the first region of the N linear pixel arrays, wherein said adjustment is based on the comparison of the selected at least one signal to the at least one target signal level.

7. The method for increasing dynamic range recited in claim 6 above, wherein adjusting an amount of pixel lines belonging to the first region of the N linear pixel arrays further comprises altering the amount of pixel lines belonging to the first region by a predetermined proportion of the amount of pixel lines.

8. The method for increasing dynamic range recited in claim 6 above, wherein adjusting an amount of pixel lines belonging to the first region of the N linear pixel arrays further comprises altering the amount of pixel lines belonging to the first region by a predetermined number of pixel lines.

9. The method for increasing dynamic range recited in claim 6 above further comprises modifying an amount of pixel lines belonging to the second region based on the sum of pixel lines in the first region and second region being equivalent to an amount of pixels in any one of the N linear arrays.

10. The method for increasing dynamic range recited in claim 9 above, wherein said amount of pixels in each of the N linear arrays is M pixels.

11. The method for increasing dynamic range recited in claim 9 above further comprises:

integrating charge in at least some pixels of the N linear pixel arrays;

combining charge from the first region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from said adjusted amount of pixel lines of the first region along each of the N linear pixel arrays to each of the N registers;

shifting charge from the N registers along a linear path;

representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals;

combining charge from the second region of the N linear pixel arrays in the N registers by shifting charge from said modified amount of pixel second region along each of the N linear pixel arrays to each of the N registers; and

shifting charge from the N registers along a linear path; and

representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals.

12. The method for increasing dynamic range recited in claim 6 above, wherein said adjustment based on the comparison of the selected at least one signal to the at least one target signal level relates to difference betweens the selected at least one signal to the at least one target signal level.

13. The method for increasing dynamic range recited in claim 6 above, wherein the at least one target signal is a range of target signal levels, and said adjustment based on the comparison of the selected at least one signal to the at least one target signal level relates to a difference between the selected at least one signal to the range of target signal levels.

14. The method for increasing dynamic range recited in claim 4 above, wherein defining the first region of the N linear pixel arrays of the imaging sensor is accomplished during a setup phase of a device incorporating said imaging sensor.

15. The method for increasing dynamic range recited in claim 4 above, wherein defining the first region of the N linear pixel arrays of the imaging sensor is accomplished dynamically, following said integrating charge in at least some pixels of the N linear pixel arrays, and prior to a subsequent integration of charge in at least some pixels of the N linear pixel arrays.

16. The method for increasing dynamic range recited in claim 1 above further comprises:

presenting said portion of N first region data signals as a first channel of small-amplitude signals; and

presenting said portion of N second region data signals as a second channel of large-amplitude signals.

17. The method for increasing dynamic range recited in claim 16 above further comprises:

re-scaling one of said small-amplitude signals from said first region and said large-amplitude signals from said second region.

18. The method for increasing dynamic range recited in claim 17 above, wherein re-scaling one of said small-amplitude signals from said first region and said large-

amplitude signals from said second region is based on a scale of the other of said small-amplitude signals from said first region and said large-amplitude signals from said second region.

19. The method for increasing dynamic range recited in claim 16 above further comprises:

determining a relationship between said small-amplitude signals of said first channel from said first region, and said large-amplitude signals of said second channel from said second region.

20. The method for increasing dynamic range recited in claim 19 above further comprises:

applying said relationship to the corresponding at least one data signal from the N data signals representing charge from the first region of the N linear pixel arrays; and

replacing said at least one of the N data signals representing a saturated condition from the second region of the N linear pixel arrays.

21. The method for increasing dynamic range recited in claim 20 above, wherein each of said N linear pixel arrays corresponds to a wavelength channel of an N wavelength channel spectrum and each of said N data signals representing an amplitude of said N wavelength channels of the spectrum.

22. The method for increasing dynamic range recited in claim 21 above further comprises:

presenting as a wide dynamic-range spectrum, the data signals from the second channel of large-amplitude signals representing charge from said second region, and, the corresponding at least one data signal from the N data signals representing charge from the first region of the N linear pixel arrays replacing said at least one of the N data signals representing a saturated condition from the second region of the N linear pixel arrays.

23. The method for increasing dynamic range recited in claim 1 above, wherein a corresponding each of said portion of N first region data signals and each of said portion of N second region data signals both correspond to at least one discrete wavelength.

24. The method for increasing dynamic range recited in claim 1 above further comprises:

combining a part of said portion of N first region data signals with a non-corresponding part of said portion of N second region data signals; and

presenting the part of said portion of N first region data signals and the non-corresponding part of said portion of N second region data signals as a plurality of data signals.

25. An imaging apparatus having enhancing dynamic range comprising:

an imaging sensor comprising:

N linear arrays, each of the N linear arrays having M charge coupled pixels;

M pixel lines, said M pixel lines being oriented in generally orthogonal direction to the N linear pixel arrays;

N registers, wherein one pixel in each of the N linear pixel arrays being charge coupled to a respective one of the N registers;

signal converter connected to at least one of said N registers for representing a charge as a data signal; and

an output node coupled to said signal converter ;

a memory connected to said output node;

a readout controller coupled to said imaging sensor for controlling readout of said M charge coupled pixels in all the N linear pixel arrays; and

means for instructing said readout controller for combining charge from a first region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the first region along each of the N linear pixel arrays to each of the N registers, said first region of the N linear pixel arrays having at least one pixel line, and for shifting charge from the N registers along a linear path to said signal converter, and for transferring said N first region data signals to said memory, and further for instructing said readout controller for combining charge from a second region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge along each of the N linear pixel arrays to each of the N registers and for shifting charge from the N registers along a linear path to said signal converter, and for transferring said N second region data signals to said memory.

26. The imaging apparatus recited in claim 25 above, wherein said memory being coupled to a display device.

27. The imaging apparatus recited in claim 25 above, wherein said means for instructing alters an amount of pixel lines in a region prior to instructing said readout controller.

28. A computer program product, comprising a computer-readable medium having stored thereon computer executable instructions for implementing a method for enhancing dynamic range of data read from an imaging sensor having a controller that executes a plurality of reordered commands, said computer executable instructions comprising:

instructions for integrating charge in at least some pixels of the N linear pixel arrays;

instructions for combining charge from a first region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the first region along each of the N linear pixel arrays to each of the N registers, said first region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays;

instructions for shifting charge from the N registers along a linear path;

instructions for representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals;

instructions for combining charge from a second region of the N linear pixel arrays in the N registers by shifting charge from said at least one pixel line of the second region along each of the N linear pixel arrays to each of the N registers, said second region having at least one pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays; and

instructions for shifting charge from the N registers along a linear path; and

instructions for representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals.

29. The computer program product recited in claim 28 above further comprises:

instructions for defining the first region of the N linear pixel arrays of the imaging sensor by designating at least one pixel line as belonging to the first region of the N linear pixel arrays.

30. The computer program product recited in claim 29 above further comprises:

instructions for assessing a level of improvement in dynamic range in at least one signal taken from the portion of N first region data signals, and the portion of N second region data signals; and

instructions for determining an amount of pixel lines belonging to the first region of the N linear pixel arrays for improving the dynamic range in the at least one signal, wherein said amount of pixel lines relates to the level of improvement in dynamic range.

31. The computer program product recited in claim 29 above further comprises:

instructions for setting at least one target signal level;

instructions for selecting at least one signal from one of the portion of N first region data signals and the portion of N second region data signals;

instructions for comparing the selected at least one signal to the at least one target signal level; and

instructions for adjusting an amount of pixel lines belonging to the first region of the N linear pixel arrays, wherein said adjustment is based on the comparison of the selected at least one signal to the at least one target signal level.

32. The computer program product recited in claim 31 above further comprises:

instructions for altering the amount of pixel lines belonging to the first region by a predetermined proportion of the amount of pixel lines.

33. A method for reading data from an imaging sensor, said imaging sensor comprising N linear pixel arrays, each of the N linear arrays having M charge coupled pixels, each pixel charge coupled, and further being coupled to one of N registers, the method comprising:

defining a first region of the N linear pixel arrays of the imaging sensor, said first region having at least one pixel line and said at least one pixel line is oriented in generally orthogonal direction to the N linear pixel arrays;

defining a second region of the N linear pixel arrays of the imaging sensor, said second region having at least one pixel line and said at least one pixel line is oriented in generally orthogonal direction to the N linear pixel arrays;

defining a dark region of the N linear pixel arrays of the imaging sensor, said dark region having a plurality of pixel lines, said plurality of pixel lines are oriented in generally orthogonal direction to the N linear pixel arrays and said plurality of pixel lines are not exposed to light;

receiving a first image on at least some pixels of the first region of the N linear pixel arrays;

receiving a second image on at least some pixels of the second region of the N linear pixel arrays;

integrating charge in the at least some pixels of the first region of the N linear pixel arrays and in the at least some pixels of the second region of the N linear pixel arrays;

shifting charge from the at least some pixels of the first region and second region of the N linear pixel arrays along a linear path into said dark region of the N linear pixel arrays of the imaging sensor; and

reading out charge from said dark region, said charge from said dark region having been shifted from each region defined on the N linear pixel arrays of the imaging sensor.

34. The method for reading data recited in claim 33 above, wherein, for each region, reading out charge from said dark region further comprises:

combining charge integrated in a region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark region along each of the N linear pixel arrays to each of the N registers;

shifting charge from the N registers along a linear path; and

representing charge from at least a portion of the region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N data signals associated with the region.

35. The method for reading data recited in claim 34 above further comprises:

shifting charge from the dark region of the N linear pixel arrays of the imaging sensor in the N registers; and

discarding the charge shifted from the dark region of the N linear pixel arrays of the imaging sensor.

36. The method for reading data recited in claim 34 above, wherein the first region is further defined as a third region and a fourth region of the N linear pixel arrays of the imaging sensor.

37. The method for reading data recited in claim 36 above further comprises:

presenting said corresponding portion of N first region data signals; and

presenting said corresponding portion of N second region data signals.

38. The method for reading data recited in claim 37 above, wherein presenting said portion of N first region data signals further comprises:

presenting said corresponding portion of N third region data signals; and

presenting said corresponding portion of N fourth region data signals.

39. The method for reading data recited in claim 33, wherein a sum of the pixel lines defined in said first region, said second region and said dark region comprises at least M pixel lines.

40. The method for reading data recited in claim 39, wherein said plurality of pixel lines of the dark region of the N linear pixel arrays is defined as at least M/2 pixel lines.

41. A method for reading data from an imaging sensor, said imaging sensor comprising N linear pixel arrays, each of the N linear arrays having M charge coupled pixels, each pixel charge coupled, and further being coupled to one of N registers, the method comprising:

integrating charge in at least some pixels of a first region of the N linear pixel arrays and at least some pixels of a second region of the N linear pixel arrays, said first region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays, said second region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the at least some pixels of the first and second regions of the N linear pixel arrays along a linear path into a dark region of the N linear pixel arrays of the imaging sensor, said dark region of the N linear pixel arrays having at least two pixel lines, said at least two pixel lines of the dark region are oriented in generally orthogonal direction to the N linear pixel arrays and are not exposed to light;

combining charge integrated in the first region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark region along each of the N linear pixel arrays to each of the N registers;

shifting charge from the N registers along a linear path;

representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals;

combining charge integrated in the second region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark region along each of the N linear pixel arrays to each of the N registers;

shifting charge from the N registers along a linear path;

representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals; and

clearing charge from the dark region of the N linear pixel arrays of the imaging sensor.

42. The method for reading data recited in claim 41 above further comprises:

presenting said portion of N first region data signals; and

presenting said portion of N second region data signals.

43. The method for reading data recited in claim 42 above, wherein said first portion comprises N first region data signals and said second portion comprises N second region data signals.

44. The method for increasing dynamic range recited in claim 41 above, wherein integrating charge in at least some pixels of a first region of the N linear pixel arrays and at least some pixels of a second region of the N linear pixel arrays, further comprises:

accumulating charge in the at least some pixels of the first and second regions of the N linear pixel arrays for a predetermined time period.

45. The method for reading data recited in claim 41 above, wherein clearing charge from the dark region of the N linear pixel arrays further comprises:

shifting charge from the dark region of the N linear pixel arrays of the imaging sensor in the N registers; and

discarding the charge shifted from the dark region of the N linear pixel arrays of the imaging sensor.

46. The method for reading data recited in claim 41, wherein the dark region of the N linear pixel arrays comprises a quantity of pixel lines at least as great as a sum of said at least one pixel line of the first region and said at least one pixel line of the second region.

47. The method for reading data recited in claim 41, wherein the dark region of the N linear pixel arrays comprises at least M/2 pixel lines.

48. The method for reading data recited in claim 41, wherein said first region of the N linear pixel arrays having a first image projected thereon, and said second region of the N linear pixel arrays having a second image projected thereon.

49. The method for reading data recited in claim 41, wherein said first region of the N linear pixel arrays being exposed to a first light source, and said second region of the N linear pixel arrays being exposed to a second light source.

50. The method for reading data recited in claim 41 above further comprises:

integrating charge in at least some pixels of at least one other region of the N linear pixel arrays, each of said at least one other region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of said at least one other region of the N linear pixel arrays is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the at least some pixels of said at least one other region of the N linear pixel arrays along a linear path into a dark region of the N linear pixel arrays of the imaging sensor;

for each of the at least one other region of the N linear pixel arrays, combining charge integrated in one of the at least one other region of the N linear pixel arrays by shifting charge from the dark region along each of the N linear pixel arrays to each of the N registers; and

shifting charge from the N registers along a linear path.